

SMART METER LAN

Smart Energy Meter, compatible with SMA, Fronius, Solar Edge, Solis, DEYE, Huawei, SDM-630, Victron TCP (EM-24 TCP), Victron RS-485 (EM-24 RTU) etc.



100 A and 400 A version with 3.5 mm plug



1 / 5 A version with 6 screw terminals

Manual

LAN

Version 1.3

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Table of Contents

1. INTRODUCTION	3
2. INSTALLATION	4
2.1 Safety instructions	4
2.2 Device overview LAN	4
2.3 Pin description LAN	4
2.4 IP address	5
2.5 Current sensors (CT)	5
2.5.1 Current sensor 100 A dimensions	5
2.5.2 Current sensor 400 A dimensions	5
2.6 RS 485 pin out LAN	6
2.7 LED status	6
3 COMMISSIONING	6
3.1 First time power on	6
4 GRAPHICAL USER INTERFACE	7
4.1 Overview	7
4.2 Settings	8
5 SMA EMETER COMPATIBLE MODE	9
5.1 elgris connection with SMA Home Manager	10
6 MODBUS TCP	11
6.1 Register mapping Common Model	11
6.2 Register mapping WYE connect Meter Model	11
7 TECHNICAL SPECIFICATIONS	13

1. Introduction

Dear customer, thank you for purchasing this product. The SMART METER measures your consumption and feed-in values in real-time. These values can be shown anytime, anywhere on our website.

The SMART METER has the following features:

- Single or three phase measurements
- SMA Smart Meter EMETER-10 compatible
- Fronius, Solar Edge, Huawei, Victron EM-24, SDM-630 TCP/RTU etc compatible
- Integrated SUNSPEC MODBUS/TCP Server
- Feed-in and consumption Real-time Measurement
- Cloud solution integration possible for analysis
- Easy to use via integrated web configuration

Specializing in products for renewable energy, Diesel generators and hybrid power solutions, the SMART METER offers the following features standard:

- Wide range power supply input from: 100 - 240 V_{AC} (50 - 60 Hz)
- Small footprint.
- Intuitive software.
- Wide temperature range of: -25° – +60°C.
- Protection type IP-20.

If you have any questions or if something is unclear, you can contact us in several ways:

E-Mail : support@elgris.de

Phone : +49 (0) 2423 9086501

2. Installation

2.1 Safety instructions

Before installing the product in the end-installation, ensure that the device is not damaged during transport and everything looks in a normal way.

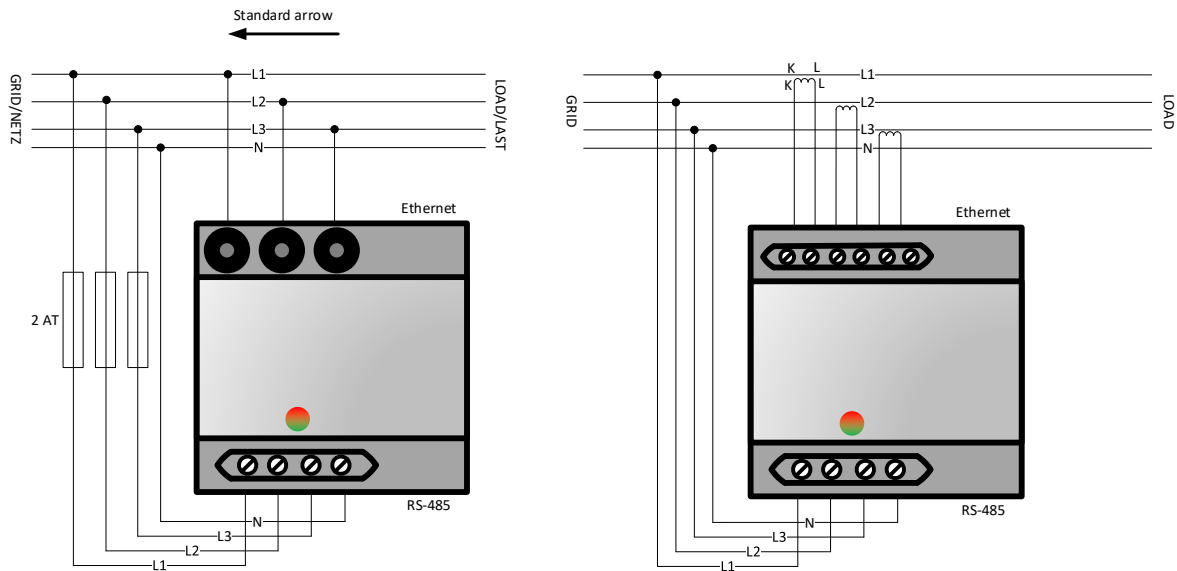
All the connecting cables must not be bent or squeezed. This can result in malfunctions, short circuits and defects in the device and/or sensor connected.

Make sure that cables are not damaged when drilling or bolting in place.

The module may only be commissioned after it has been installed contact-free in a casing. This product generates high frequency. Never operate it in the vicinity of medical devices (e.g. pacemakers) and/or medical equipment (e.g. in hospitals). Look for a suitable installation site.

2.2 Device overview LAN

Before wiring the device, be sure that the voltage is switched off.



2.3 Pin description LAN

	Pin	Description	Minimum	Maximum
Voltage input	1	Phase 1 voltage input	100 Vac	240 Vac
	2	Phase 2 voltage input	100 Vac	240 Vac
	3	Phase 3 voltage input	100 Vac	240 Vac
	4	Neutral input of voltage		0 Vac
Power input	5	K input current transformer L1	0 Aac	5 Aac
	6	L input current transformer L1	0 Aac	5 Aac
	7	K input current transformer L2	0 Aac	5 Aac
	8	L input current transformer L2	0 Aac	5 Aac
	9	K input current transformer L3	0 Aac	5 Aac
	10	L input current transformer L3	0 Aac	5 Aac
Dipswitch	1	IP address selection	OFF = DHCP	ON = static
	2	System frequency	OFF = 50 Hz	ON = 60 Hz
	3	Single or Three phase	OFF = Three phase	ON = Single phase
	4	Internal use only	OFF = Default	

2.4 IP address

The SMART METER can be operated via dipswitch 1 with a static address 192.168.1.100 (dipswitch 1 ON when switched on). If you are not familiar with IP addresses, then set dipswitch 1 to OFF and switch on the SMART METER (apply voltage between L1 and N). You can now query the current IP address via your router.

- ☞ Please note that the IP address can only be set when the module is without power. The current settings are only requested once when starting up.

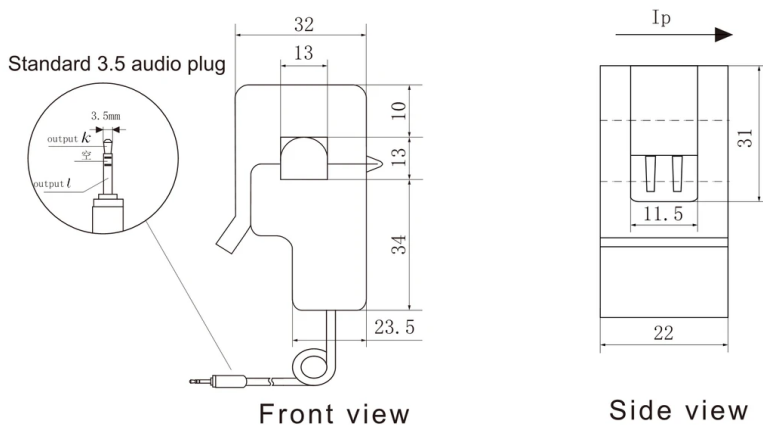
2.5 Current sensors (CT)

Current transformers are required for the SMART METER; direct measurement is not possible!

Depending on your SMART METER version, elgris folding converters with 100 A or 400 A can be used, which have an integrated cable of around 1 meter in length and a 3.5 mm plug.

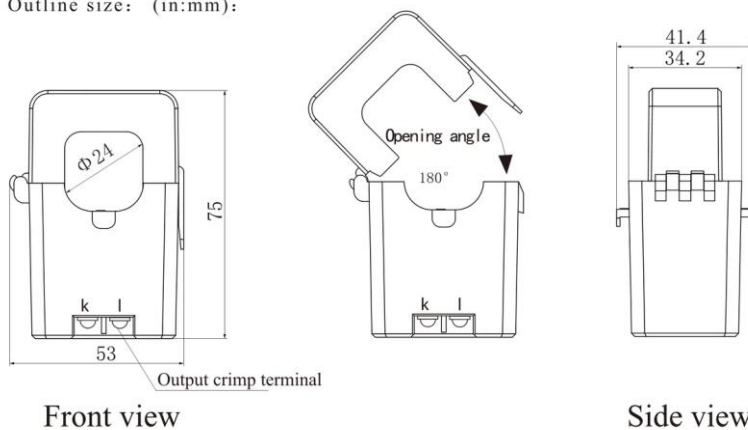
By default, the arrow on the blue 100 A folding converter must point to the network for a positive value (consumption). If the arrow points to the consumer, the feed-in is positive and the consumption is negative.

2.5.1 Current sensor 100 A dimensions

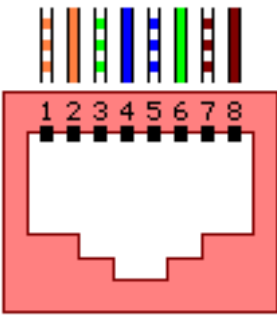


2.5.2 Current sensor 400 A dimensions

Outline size: (in:mm):



2.6 RS 485 pin out LAN

	Pin	Description
	1	Not connected
	2	RS-232 TX
	3	RS-232 RX
	4	RS-485 B (D-) port 1 / A
	5	RS-485 A (D+) port 1 / A
	6	GND for both RTU ports
	7	RS-485 B (D-) port 2 / B
	8	RS-485 A (D+) port 2 / B

2.7 LED status

The LED on board informs the user about the internal status.

LED colour	Meaning	Action
Off	No power or internal error	Contact support
	Internal Error	Contact support
	Wiring error or export	Check the phase sequence and phase assignment
	normal operation	

3 Commissioning

Before starting with the commissioning of the SMART METER all safety precautions must be taken which apply to the rules in your country and general safety rules. Never work on a system with a connected grid before working on the power system.

Only a few settings are needed to commission the SMART METER.

Most important is the settings of the current transformer.

3.1 First time power on

Follow the following steps when the system is first time being powered.

- ☞ Start the METER by applying power to L1 and N in case you use a single-phase system or L1, L2 and L3 with N for three phase systems. When the SMART METER unit is working properly, the LED is blinking green.
- ☞ When using a LAN connection ensure that your computer is in the same network and has an IP address within the same range. In case you are using the DHCP server you need to know the IP address of the SMART METER.
- ☞ Connect to the embedded webserver by typing the default address 192.168.1.100 or DHCP address in a web browser. Please note that the used computer must be in the same address range.

- ☞ The default password for the settings is “12345678”
- ☞ On the Settings Menu select Meter to adjust the CT ratio. The CT ratio is defined as 1: value. For example, when you have a CT 5:200 the custom CT value is 40. The CT ratio for the SMART METER with 100 A and 400 A select the right value.
- ☞ When the CT ratio is changed the power readings on the overview page should match the actual power. A positive value is consumption from the grid, a negative value means exporting to the grid. When this is not correct, check the wiring of K and L of the CT. For current clamps, swap the direction.
- ☞ Further settings can be changed depending on the application.
- ☞ To ensure all settings are stored properly, perform a reset.

4 Graphical User Interface

The SMART METER contains a web server to adjust the system parameters and display the status of the system.

The integrated web server can be accessed via a normal browser. Supported web browsers are Microsoft Edge, Google Chrome and Mozilla Firefox.

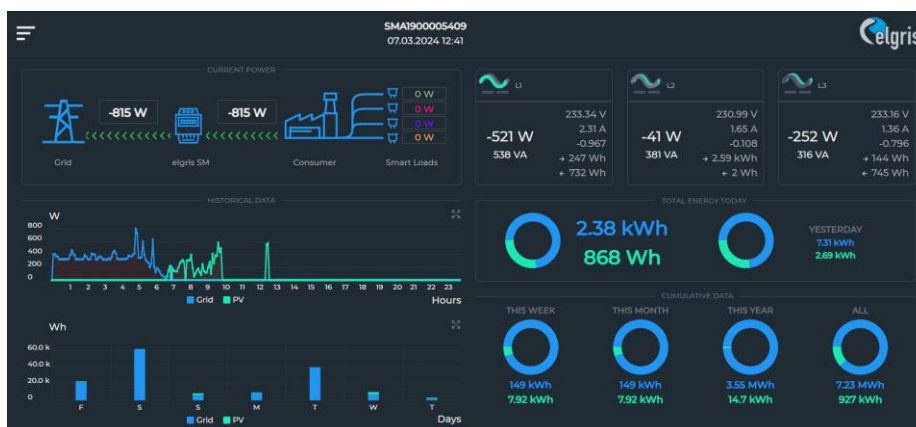
The current address at which you can reach the SMART METER depends on dipswitch 1.

If dipswitch 1 is up (ON), then you can reach the SMART METER at the static address 192.168.1.100.
When the static address is changed, use the new address instead.

If dipswitch 1 is down, then the SMART METER receives an automatic address (DHCP).

You can read the current address on the router interface.

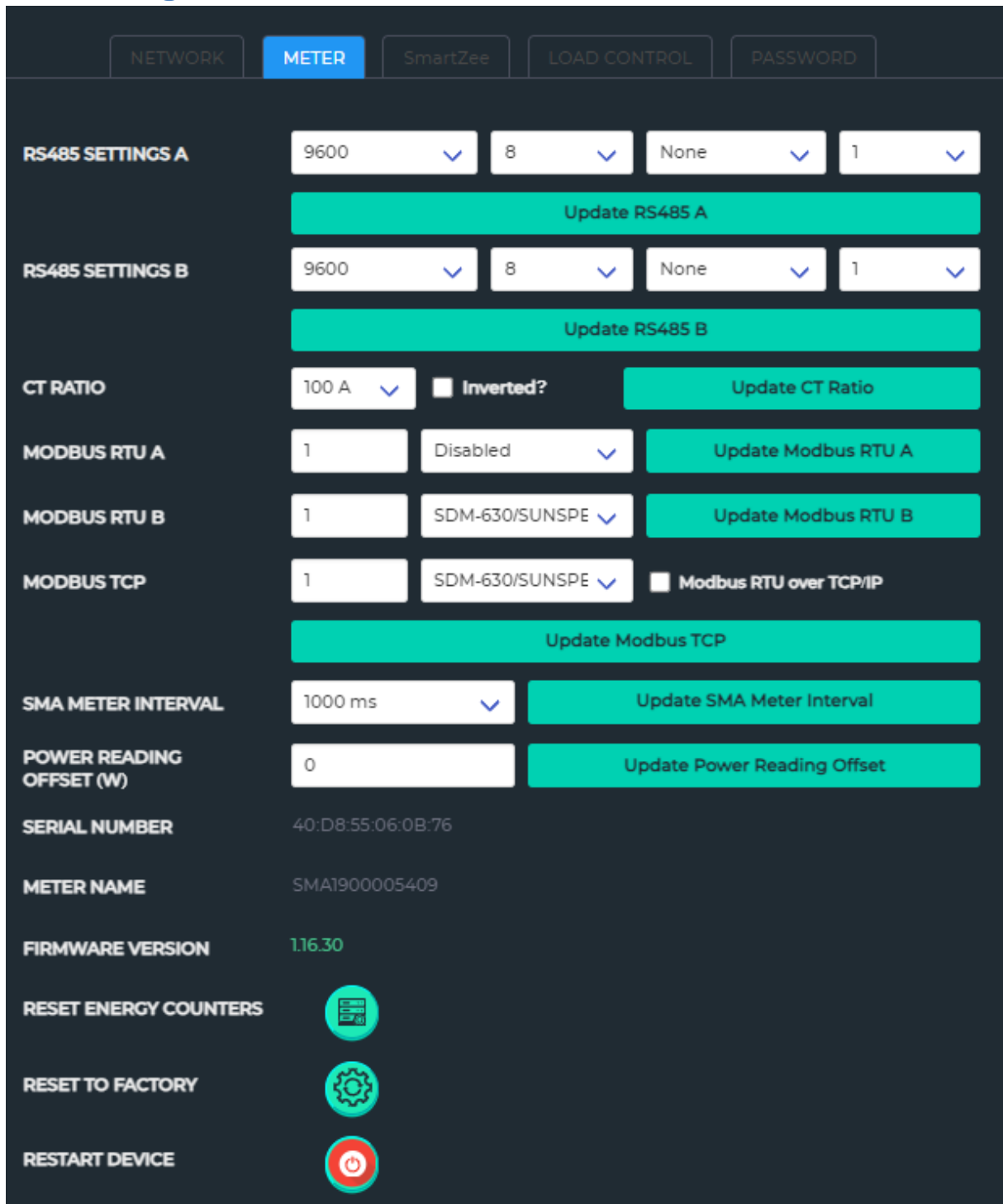
4.1 Overview






Header with status information and menu

Main area with system information

4.2 Settings



RS485 SETTINGS A	9600	8	None	1	Update RS485 A
RS485 SETTINGS B	9600	8	None	1	Update RS485 B
CT RATIO	100 A	<input type="checkbox"/> Inverted?	Update CT Ratio		
MODBUS RTU A	1	Disabled	Update Modbus RTU A		
MODBUS RTU B	1	SDM-630/SUNSPE	Update Modbus RTU B		
MODBUS TCP	1	SDM-630/SUNSPE	<input type="checkbox"/> Modbus RTU over TCP/IP	Update Modbus TCP	
SMA METER INTERVAL	1000 ms	Update SMA Meter Interval			
POWER READING OFFSET (W)	0	Update Power Reading Offset			
SERIAL NUMBER	40:D8:55:06:0B:76				
METER NAME	SMA1900005409				
FIRMWARE VERSION	1.16.30				
RESET ENERGY COUNTERS					
RESET TO FACTORY					
RESTART DEVICE					

On this page the settings for the Modbus baud rate, protocol and SMA metering settings can be changed.

The elgris SMART METER will simulate an original meter, make sure the settings match the original meter settings.

- ☞ No the full mapping per meter is implemented, only the for the common application needed registers. More registers can be added on request.

5 SMA EMETER compatible mode

The elgris SMART METER is compatible with the SMA EMETER-10 and EMETER-20. This means that SMA inverters recognize the elgris SMART METER as being a SMA EMETER.

The following picture shows an elgris SMART METER in the SMA inverter software:

The screenshot shows the 'SUNNY BOY 1.5' web interface. The top navigation bar includes 'Home', 'Instantaneous Values', 'Device Parameters', 'Events', and 'Device Configuration'. The main content area is divided into 'Devices in the system' and 'Devices found' sections, both containing tables with columns for device name, status, serial number, and firmware version. A 'User Information' sidebar on the right provides 'Device Configuration' instructions, such as changing device names, updating firmware, and saving configurations.

The SMA inverter transmit the metering data to the online Sunny Places portal. In addition, also the elgris cloud can be used since the SMA only shows the power and not the individual parameters like voltage, current, power factor etc.

The screenshot displays the 'SUNNY PORTAL' interface. The top navigation bar includes 'SUNNY PORTAL' and 'English'. The main content area is titled 'PV System Overview | Prüfstand'. It features a sidebar with navigation options like 'Prüfstand', 'PV System Overview', 'Current Status', 'Energy Balance', 'Annual Comparison', 'PV System Monitoring', 'PV System Logbook: 15', 'Inverter', and 'Configuration'. The main content area shows 'PV System Data' with metrics for 'Current PV Power' (0 W), 'Current consumption' (0 W), 'Current PV system status' (green checkmark), 'PV Energy' (34 Wh), 'CO2 avoided' (24 g), 'PV system information' (1550 Wp, 08/01/2018), 'Weather for Inden' (6 °C, Cloudless), and 'Location' (52459 Inden, Germany). Below this is a table of parameters:

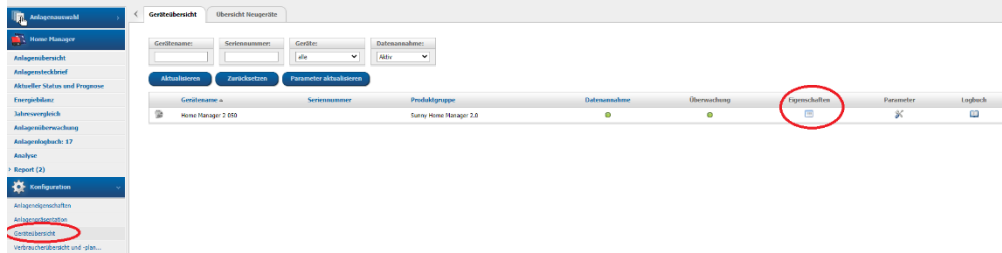
Parameters	Value	Timestamp	Icon
OptiTrac Global Peak switched on	Yes	13/02/2018 09:30:04	
Country standard set	VDE-AR-N4105	13/02/2018 12:31:32	
Speedwire meter serial no.	1900012339	13/02/2018 09:32:29	
Device name	SB1.5-1VL-40 187	13/02/2018 11:16:20	
Device class	Solar Inverters	13/02/2018 09:30:04	
Device type	Sunny Boy 1.5	13/02/2018 09:30:04	
Software package	2.05.01.R	13/02/2018 09:32:29	
Fallback active power limitation, reg. to grid connection point	1500	13/02/2018 10:16:20	
Fallback active power limitation as %, reg. to grid connection point	100	13/02/2018 11:16:24	
Set active power limit at grid connection point	1500	13/02/2018 10:16:20	

5.1 elgris connection with SMA Home Manager

The elgris SMART METER LAN can also be operated as an energy meter in combination with an SMA Home Manager. The elgris SMART METER can be used either for PV generation or as grid measurement.

Like the SMA energy meter, the elgris SMART METER is not displayed as an independent device in Sunny Portal.

Go to the device overview and select the properties of the SHM.



Then click on "Edit" at the bottom and select "Advanced configuration" at the top.



In the "Meter configuration" menu item you can now select the elgris SMART METER as an SMA energy meter. Finally, the configuration must be saved.

Zählerkonfiguration

Bezug und Einspeisung:	SMA Energy Meter 1900055144	
PV-Erzeugung:	kein Zähler Internes Energy Meter SMA Energy Meter 1900055144	<i>!</i> Es werden die PV-Erzeugungsdaten der angeschlossenen SMA Wechselrichter verwendet.
Messintervall internes Energy Meter:	1000 ms	<i>!</i>
Direkte Zähler Kommunikation:	Geräte IP 1: <input type="text"/> Geräte IP 2: <input type="text"/> Geräte IP 3: <input type="text"/>	<i>!</i>

6 MODBUS TCP

The elgris SMART METER includes a MODBUS TCP server with parameter mapping similar to SunSpec parameter list 203. By offering an open protocol the implementation can be easily adopted to the user needs.

The MODBUS uses port 502 by default.

6.1 Register mapping Common Model

The first register address is 40000 and the registers can be read with function 0x03.

Address	Size	Name	Label	Value	Type	R/W	Description
40000	2	ID	Common	1	uint32	R	Value = "SunS" (0x53756e53). Uniquely identifies this as a SunSpec MODBUS Map
40002	1	DID	SunSpec_DID	1	uint16	R	Value = 0x0001. Uniquely identifies this as a SunSpec Common Model Block
40003	1	L	SunSpec_Length	65	uint16	R	65 = Length of block in 16-bit register
40004	16	Mn	Manufacturer		string	R	"elgris"
40020	16	Md	Model		string	R	"SMART METER"
40036	8	Opt	Options		String	R	Not used, for future compatibility
40044	8	Vr	Version		string	R	"1.10.15"
40052	16	SN	Serial Number		string	R	19000XXXX (SMA serial compliant)

6.2 Register mapping WYE connect Meter Model

Address	Size	Name	Label	Value	Type	R/W	Description
40069	1	ID	WYE-connect three phase (abcn) meter	1	uint16	R	Value = 203 Uniquely identifies this as a SunSpec 203 MODBUS Map
40070	1	L	SunSpec_Length	105	uint16	R	105 = Length of block in 16-bit register
40071	1	A	Amps		int16	R	Total AC current
40072	1	AphA	Amps Phase A		int16	R	Phase A current
40073	1	AphB	Amps Phase B		int16	R	Phase B current
40074	1	AphC	Amps Phase C		int16	R	Phase C current
40075	1	A_SF			sunssf	R	Current scale factor
40076	1	PhV	Voltage LN		int16	R	Line to neutral AC voltage
40077	1	PhVphA	Voltage AN		int16	R	Phase voltage AN
40078	1	PhVphB	Voltage BN		int16	R	Phase voltage BN
40079	1	PhVphC	Voltage CN		int16	R	Phase voltage CN
40080	1	PPV	Voltage LL		int16	R	Line to Line AC voltage
40081	1	PhVphAB			uint16	R	Line voltage AB
40082	1	PhVphBC			uint16	R	Line voltage BC

40083	1	PhVphCA			uint16	R	Line voltage CA
40084	1	V_SF			sunssf	R	Voltage scale factor
40085	1	Hz	Hz		int16	R	Frequency
40086	1	Hz_SF			sunssf	R	Frequency scale factor
40087	1	W	Watts		int16	R	Total real power
40088	1	WphA	Watts phase A		int16	R	Real power phase A
40089	1	WphB	Watts phase B		int16	R	Real power phase B
40090	1	WpbC	Watts phase C		int16	R	Real power phase C
40091	1	W_SF			sunssf	R	Real power scale factor
40092	1	VA			int16		AC apparent power
40093	1	VApHA	VA phase A		int16	R	Apparent power phase A
40094	1	VApHB	VA phase B		int16	R	Apparent power phase B
40095	1	VApHC	VA phase C		int16	R	Apparent power phase C
40096	1	VA_SF			sunssf	R	Apparent power scale factor
40097	1	VAR			int16		AC reactive power
40098	1	VARpHA	VA phase A		int16	R	Reactive power phase A
40099	1	VARpHB	VA phase B		int16	R	Reactive power phase B
40100	1	VARpHC	VA phase C		int16	R	Reactive power phase C
40101	1	VAR_SF			sunssf	R	Reactive power scale factor
40102	1	PF	PF		int16	R	Power factor
40103	1	PFpHA	PF phase A		int16	R	
40104	1	PFpHB	PF phase B		int16	R	
40105	1	PFpHC	PF phase C		int16	R	
40106	1	PF_SF			sunssf	R	Power factor scale factor
40107	2	TotWhExp			acc32	R	Total Wh exported
40109	2	TotWhExpPhA			acc32	R	Total Wh exported phase A
40111	2	TotWhExpPhB			acc32	R	Total Wh exported phase B
40113	2	TotWhExpPhC			acc32	R	Total Wh exported phase C
40115	2	TotWhImp			acc32	R	Total Wh imported
40117	2	TotWhImpPhA			acc32	R	Total Wh imported phase A
40119	2	TotWhImpPhB			acc32	R	Total Wh imported phase B
40121	2	TotWhImpPhC			acc32	R	Total Wh imported phase C
40123	1	TotWhSF			sunssf	R	Real energy scale factor
40125	2	TotVARhExp			acc32	R	Total VAR exported
40127	2	TotVARhExpPhA			acc32	R	Total VAR exported phase A
40129	2	TotVARhExpPhB			acc32	R	Total VAR exported phase B
40131	2	TotVARhExpPhC			acc32	R	Total VAR exported phase C
40133	2	TotVARhImp			acc32	R	Total VAR imported
40135	2	TotVARhImpPhA			acc32	R	Total VAR imported phase A

7 Technical specifications

		LAN Versions depending	
		Wert	
General	Controller		32 Bits CPU
	Interface LAN		10 / 100 Mbit MDIX
	Interface RS-485		1200 – 115200 Baud
	Rated voltage	Vac	230 / 400
	Operating voltage	Vac	100 – 240
	Frequency range	Hz	50 / 60
	Total own consumption	W	< 1
	Current	mA	50 / 100 / 1000 / 5000 (Wandler)
	Starting current	mA	1
Accuracy	Voltage	%	0,5
	Current	%	0,5
	Active power	%	1,0
	Apparent power	%	1,0
	Reactive power	%	1,0
	Power factor (PF)	%	1,0
	Active power IEC 62053-22		Klasse 1
	Protection degree		II
Environment	IP rating		IP20
	Weight	kg	0,2 – 0,3
	Dimensions	TE	4
	Connection cross section terminals	mm ²	< 4
	Ambient temperature	°C	-10 – 40
	Maximum altitude above sea level	m	1000